

Application No. 09/989,516
Response to Office Action

Listing of Claims:

1. (Currently Amended) A lens driving device comprising:
a lens optical system having a moving lens group movable
along a direction of an optical axis, and a focal length which
can be altered in stages among a plurality of values;
5 a moving lens group frame holding said moving lens group;
an aperture device provided within said lens optical system,
and having a variable aperture value which can be modified in
both an ascending and descending manner;
a single driving source for changing the focal length value
10 of said lens optical system and the aperture value of said
aperture device; and
a driving member driven by said single driving source for
driving said moving lens group frame to achieve a desired focal
length value of said lens optical system from among said
15 plurality of focal length values, and for then driving the
aperture device to change the variable aperture value of said
aperture device in at least one of the ascending and descending
manner at the desired focal length value while maintaining the
desired focal length value;
20 wherein the driving member is adapted to drive the aperture
device to change the variable aperture value in both the

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ascending direction and in the descending direction while
maintaining the desired focal length value.

2. (Previously Presented) The lens driving device
according to Claim 1, wherein said driving member includes:

5 a lens driving cam comprising, in sequential connection, a
first cam region which performs driving to displace said moving
lens group frame in the optical axis direction, and a second cam
region which does not perform driving to displace said moving
lens group frame in the optical axis direction; and
an aperture driving cam formed separately from said lens driving
cam for performing driving to change the aperture value of said
10 aperture device when said moving lens group frame is in a state
of not being displaced in the optical axis direction due to said
moving lens group frame being in said second cam region.

3. (Previously Presented) The lens driving device
according to Claim 2, wherein:

said driving member comprises a cam ring of cylindrical
shape having a substantially uniform wall thickness; and

5 said lens driving cam and said aperture driving cam are
formed in the cam ring of cylindrical-shape as cam holes or as
cam grooves.

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4. (Previously Presented) The lens driving device according to Claim 2, wherein:

said aperture driving cam is formed so as not to change the aperture value of said aperture device during driving displacement of said moving lens group frame in the first cam region.

5. (Previously Presented) The lens driving device according to Claim 2, further comprising an impelling member, provided in said aperture device, which impels said aperture device in a prescribed direction such that the aperture value of said aperture device assumes a value determined in advance; and

wherein while said moving lens group frame is driven and displaced in the first cam region, said aperture value of said aperture device attains said aperture value set in advance by means of the impelling force of said impelling member, without said aperture device being engaged with said aperture driving cam.

6. (Previously Presented) The lens driving device according to Claim 5, wherein said aperture device is impelled in a direction in which an aperture diameter is decreased.

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7. (Previously Presented) The lens driving device according to Claim 1, wherein said driving member is formed such that said moving lens group frame is driven to achieve the desired focal length of said lens optical system, and said aperture device can then be driven to modify the aperture value while maintaining the desired focal length value.

8. (Previously Presented) The lens driving device according to Claim 2, wherein said driving member is formed such that said moving lens group frame is driven to achieve the desired focal length of said lens optical system, and said aperture device can then be driven to modify the aperture value while maintaining the desired focal length value.

9. (Currently Amended) A lens driving device comprising:
two moving lens group frames, each capable of different movement in an optical axis direction;
an aperture device provided in one of said moving lens group frames, and having a variable aperture value which can be modified in both an ascending and descending manner;
a cam member including: (i) two lens driving cams each having a first cam portion and a second cam portion that are formed successively to drive corresponding moving lens groups,

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10 and (ii) a third cam portion formed separately from said lens
driving cams; and

15 a single driving source for driving said cam member to drive
and displace said moving lens group frames to a desired focal
length value and to drive said aperture device for changing the
variable aperture value;

wherein:

said first cam portion is provided in a range in which
said moving lens group frames are driven and displaced in the
optical axis direction;

20 said second cam portion is provided in a range in which
said moving lens group frames are not driven and displaced in the
optical axis direction; and

25 said third cam portion drives said aperture device to
change the variable aperture value in at least one of the
ascending and descending manner at the desired focal length value
when said moving lens group frames are in a state of not being
displaced in the optical axis direction due to said moving lens
group frames being in the range of said second cam portion;

30 wherein the third cam portion is adapted to drive the
aperture device to change the variable aperture value in both the
ascending direction and in the descending direction while
maintaining the desired focal length value.

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10. (Previously Presented) The lens driving device according to Claim 9, further comprising control means for controlling operation of said cam member, as driven by said driving source, to set a focal length obtained by movement of said moving lens group frames and the aperture of said aperture device to desired values.

11. (Previously Presented) The lens driving device according to Claim 9, wherein:

said cam member comprises a cam ring of cylindrical shape having a substantially uniform wall thickness; and

said first cam portion, said second cam portion, and said third cam portion are formed as cam holes or cam grooves in the cam ring of cylindrical-shape.

12. (Previously Presented) The lens driving device according to Claim 9, wherein:

said third cam portion is formed so as not to change the aperture value of said aperture device during driving displacement of said moving lens group frames in the first cam portion.

13. (Previously Presented) The lens driving device according to Claim 9, further comprising an impelling member,

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provided in said aperture device, which impels said aperture device in a prescribed direction such that the aperture value of
5 said aperture device assumes a value determined in advance; and
wherein while said moving lens group frames are driven and displaced in the first cam portion, said aperture value of said aperture device attains said aperture value set in advance by means of the impelling force of said impelling member, without
10 said aperture device being engaged with said third cam portion.

14. (Previously Presented) The lens driving device according to Claim 9, wherein said aperture device is impelled in a direction in which an aperture diameter is decreased.

15. (Previously Presented) The lens driving device according to Claim 9, wherein said cam member is formed such that said moving lens group frames are driven to achieve a desired focal length value, and said aperture device can then be driven
5 to modify the aperture value while maintaining the desired focal length value.